

**NATIONAL TRANSPORTATION SAFETY BOARD  
Office of Research and Engineering  
Vehicle Recorder Division  
Washington, D.C. 20594**



**SPECIALIST'S FACTUAL REPORT OF INVESTIGATION**

**DCA13IA037**

**By  
James Cash**

**WARNING**

The reader of this report is cautioned that the summary of a cockpit voice recorder audio recording is not a precise science. The summary or parts thereof, if taken out of context, could be misleading. The summary should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the summary as the sole source of information.

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March 7, 2013

## **Cockpit Voice Recorder - 12**

### **Specialist's Summary Report**

**By James Cash**

#### **A. EVENT**

Location: Boston, Massachusetts  
Date: January 07, 2013, 1021 Eastern Standard Time (EST)\*  
Aircraft: Boeing 787, JA829J  
Operator: JAL, Flight 008  
NTSB Number: DCA13IA037

#### **B. GROUP**

A group was not convened

#### **C. SUMMARY**

On January 7, 2013, about 1021 Eastern Standard Time, smoke was discovered by cleaning personnel in the aft cabin of a Japan Airlines (JAL) Boeing 787, JA829J, that was parked at a gate at Logan International Airport, Boston, Massachusetts. About the same time, a maintenance manager in the cockpit observed that the auxiliary power unit (APU) had automatically shut down. Shortly afterward, a mechanic opened the aft electronic equipment bay and found smoke and flames coming from the APU battery. No passengers or crewmembers were aboard the airplane at the time, and none of the maintenance or cleaning personnel aboard the airplane was injured. Aircraft rescue and firefighting responded to the battery fire, and one firefighter received minor injuries. The airplane had arrived from Narita International Airport, Narita, Japan, as a regularly scheduled passenger flight operated as JAL flight 008 and conducted under the provisions of 14 Code of Federal Regulations Part 129. Two solid-state combination CVR/flight data recorder (FDR) recorders were sent to the National Transportation Safety Board's Audio Laboratory for readout.

#### **D. DETAILS OF INVESTIGATION**

On January 08, 2013, the NTSB Vehicle Recorder Division's Audio Laboratory received the following cockpit voice recorders (CVRs):

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\* All times are expressed in eastern standard time (EST) unless otherwise noted.

Recorder Manufacturer/Model: **GE EAFR-2100**  
Recorder Serial Number: **16PL73 (Forward recorder)**

Recorder Manufacturer/Model: **GE EAFR-2100**  
Recorder Serial Number: **16PLDM (Aft Recorder)**

### **Recorder Description**

Per ICAO this aircraft must be equipped with a CVR that records a minimum of the last 30 minutes of aircraft operation; this is accomplished by recording over the oldest audio data. The EAFR-2100 is a multifunction recorder which records flight data, audio data, and communication, navigation, surveillance air traffic management (CNSATM) messages designed to meet the characteristics of ARINC Characteristic 767, Enhanced Airborne Flight Recorder (EAFR). Two EAFRs are installed on Boeing 787 aircraft, one forward (S/N 16PL73) and one aft (S/N 16PLDM). The forward and aft recorders are powered by the left and right 28V DC buses respectively. The forward recorder is equipped with a recorder independent power supply (RIPS) to provide backup power to the recorder for approximately 10 minutes once left DC bus power is lost. The CVR function of the EAFR-2100 combination solid-state recorder, records 2 hours of high quality 4-channel digital cockpit audio data. The recorded audio data is separated by the GE download software into four 2-hour electronic audio files. The resulting audio files contain one file of information from the cockpit area microphone (CAM), another with the Captain's audio selector panel/hot microphone information, the third with Co-Pilot's audio selector panel/hot mike information and a fourth with the jump seat/observer's position audio information.

Both recorders were downloaded and evaluated for content. The forward EAFR ran approximately 10 minutes longer due to the RIPS power than did the identical unit mounted in the aft position on the aircraft. The forward recording was used to produce the CVR summary.

### **Recorder Damage**

Upon arrival at the audio laboratory, it was evident that neither of the recorders had sustained any heat or structural damage and the audio and flight data information was extracted from the recorder normally, without difficulty.

### **Audio Recording Description**

Each of the CVR channel's audio quality<sup>†</sup> is indicated in Table 1. Notably, channel number four did not contain any audio information. The Captain's and the Co-pilot's audio selector panel/hot mike channels were rated as "Fair" because the overall signal levels of these two channels was extremely low. On these two channels, the audio signals used only a small percentage of the dynamic range that was available.

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<sup>†</sup> See attached CVR Quality Rating Scale.

Additionally, superimposed on the crew audio signals, were many full volume clicks and pops that appeared randomly throughout the recording. The cockpit area microphone channel was also rated as “Fair” because of the excessive cockpit background noise associated with the channel. This high level of background noise obscured the inter-crew’s conversations both during the airborne and ground portions of the recording.

**Table 1: Audio Quality**

<b>Channel Number</b>	<b>Content/Source</b>	<b>Quality</b>
<b>1</b>	Captain’s audio selector panel/hot mike information	Fair
<b>2</b>	Co-Pilot’s audio selector panel/hot mike information	Fair
<b>3</b>	Cockpit Area Mike	Fair
<b>4</b>	Jump seat/observer’s audio information	N/A

### **Timing and Correlation**

Timing on the summary transcript was established by correlating the audio events to common events in the flight data. Specifically, the last four radio transmissions that the aircraft made were correlated to the radio transmit microphone key parameter from the flight data recorder (FDR) function. Each of the radio transmissions acted as an anchor point for a linear extrapolation between the remaining audio events. Once a correlation between the two recorders was established, a reference to local time was determined. Using the time parameter recorded on the FDR a common time conversion was established and transferred to the CVR summary transcript.<sup>‡</sup>

CVR Elapsed Time + 1459:16.6 = UTC

UTC – 5hrs = EST

The CVR times were then offset to reflect the local eastern standard time of the incident.

### **Description of Audio Events**

In agreement with the investigator-in-charge, a CVR group did not convene and only a summary was prepared. (See attached) The recording from the forward CVR begins at 0828:20 EST. At this time, the aircraft is level at flight level three nine zero and the aircraft is being controlled by Cleveland center. The recording continues

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<sup>‡</sup> For additional information concerning the flight data recorder function of the EAFR see Flight Data Recorder Group Chairman’s Factual Report of Investigation.

uninterrupted during the descent and approach into the Boston area. The aircraft is cleared to land at 0958:30 with touchdown two minutes later at 1000:24. The aircraft taxis to the gate and the engines are shut down at 1007:02. The crew is heard talking and doing paperwork until they depart the cockpit at about 1020:50. Maintenance personnel and the cleaning/service crew can be heard on the CVR recording after the crew departs the cockpit. At 1021:40 the APU shuts down and a maintenance person makes several comments about the APU shutting down by itself. At 1024:09, a female person is heard telling the maintenance person that there is smoke in the second cabin-third kitchen. The maintenance personnel depart the cockpit at 1024:22 and no other voices are heard on the CVR until the end of the recording. The recording ends at 1031:35 EST.

NOTE: Most inter-cockpit crew conversations were generally spoken in Japanese. Most aircraft related callouts and air traffic control/tower/ground radio conversations were spoken in English.

James Cash  
Vehicle Recorder Division

## **CVR Quality Rating Scale**

The levels of recording quality are characterized by the following traits of the cockpit voice recorder information:

<b>Excellent Quality</b>	Virtually all of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate only one or two words that were not intelligible. Any loss in the transcript is usually attributed to simultaneous cockpit/radio transmissions that obscure each other.
<b>Good Quality</b>	Most of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate several words or phrases that were not intelligible. Any loss in the transcript can be attributed to minor technical deficiencies or momentary dropouts in the recording system or to a large number of simultaneous cockpit/radio transmissions that obscure each other.
<b>Fair Quality</b>	The majority of the crew conversations were intelligible. The transcript that was developed may indicate passages where conversations were unintelligible or fragmented. This type of recording is usually caused by cockpit noise that obscures portions of the voice signals or by a minor electrical or mechanical failure of the CVR system that distorts or obscures the audio information.
<b>Poor Quality</b>	Extraordinary means had to be used to make some of the crew conversations intelligible. The transcript that was developed may indicate fragmented phrases and conversations and may indicate extensive passages where conversations were missing or unintelligible. This type of recording is usually caused by a combination of a high cockpit noise level with a low voice signal (poor signal-to-noise ratio) or by a mechanical or electrical failure of the CVR system that severely distorts or obscures the audio information.
<b>Unusable</b>	Crew conversations may be discerned, but neither ordinary nor extraordinary means made it possible to develop a meaningful transcript of the conversations. This type of recording is usually caused by an almost total mechanical or electrical failure of the CVR system.

**Summary Transcript of a GE EAFR-2100 solid-state cockpit voice recorder, serial number 16PL73 (FWD), installed on an JAL Boeing 787 (JA829J), which experienced a battery fire after landing at the Boston Logan International airport, Boston, Massachusetts.**

Note: Times are expressed in Eastern Standard Time (EST).

08:28:20.8 Start of recording

08:28:23.6 Flight is level in cruise flight at FL 390 talking to Chicago center

08:36:54.1 Flight handed off to Cleveland center

09:06:35.3 Flight handed off to 2nd Cleveland center controller

09:17:06.7 Flight handed off to Boston center

09:26:39.0 Flight transferred to 2nd Boston center controller

09:30:32.1 Flight cleared to descent to FL 380

09:32:56.3 Flight cleared to FL 330

09:35:14.0 Flight cleared to FL 280

09:38:09.0 Flight changed to 3rd Boston center controller

09:38:26.4 Flight cleared to FL 210

09:40:02.2 Boston center directed the flight to turn 20 degrees left vectors for descent

09:42:02.0 Flight cleared to eleven thousand feet

09:42:47.7 Flight cleared to "Lobby" intersection to cross at eleven thousand

09:44:14.6 Flight contacted Boston arrival

09:51:43.5 Flight contacted Boston approach

09:52:05.9 Flight cleared to three thousand

09:55:06.0 Flight cleared to two thousand

09:55:36.9 Flight configured with flaps 5

09:56:29.4 Flight cleared for ILS 33 approach

09:57:24.8 Flight lowered landing gear and selected flaps twenty

09:57:46.5 Flight contacted Boston tower

09:58:03.4 Flight made 2<sup>nd</sup> check-in with tower

09:58:22.5 Flight made 3<sup>rd</sup> check-in with tower

09:58:30.7 Flight was cleared to land

09:58:34.9 Flight configured with flaps twenty five

09:59:16.5 Flight reconfirmed landing runway

09:59:25.5 Flight was again cleared to land 33 left

10:00:24.1 Sound similar to touchdown

10:01:03.7 Flight was told to clear the runway at Quebec taxiway

10:01:21.2 Flight checked in with ground

10:01:30.7 Flight was cleared to taxi via bravo - lima to ramp

10:07:02.2 Captain confirmed that the APU was running and shut down the aircraft's engines at the gate

10:07:46.9 Captain contacted ground crew. He relayed one aircraft squawk:  
Intercooling filter right side message

10:11:01.5 Crew did paperwork in cockpit

10:14:17.9 Captain had radio conversation with company

10:20:50.8 Flight crew departed cockpit

10:21:40.5 APU shut down

10:21:50.4 Ground maintenance conversations about APU shutdown

10:21:58.8 Female voice asked "if that was planned?"

10:22:03.7 Maintenance comment about APU selector fail



10:22:12.5 Continuing maintenance crew conversations about the APU failure

10:22:58.4 Sounds of ground service personnel banging service carts in the background starts and continued until end of recording

10:24:09.8 Female person reported to maintenance person in cockpit that there was "smoke - 2nd cabin one - two - three- third kitchen"

10:24:22.1 Female person and maintenance personnel departed cockpit - no other voices heard during rest of the recording

10:31:35.0 The CVR recording ended